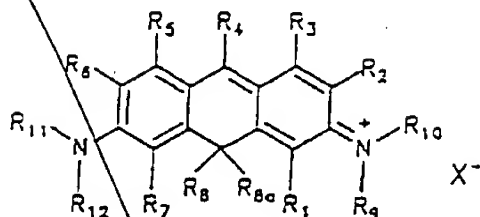


Claims

1. The use of compounds of the general formula I



as labeling groups in a procedure for the detection of an analyte, where

R₁, R₂, R₃, R₄, R₅, R₆ and R₇ are in each case independently hydrogen, halogen, a hydroxyl, amino, sulfo or carboxyl or aldehyde group or a saturated or unsaturated, straight-chain, branched or cyclic hydrocarbon group having up to 20 C atoms, where the hydrocarbon groups include alkyl, alkenyl, alkynyl, cycloalkyl, aryl, in particular phenyl, or/and heteroaryl radicals and optionally heteroatoms such as oxygen, sulfur or nitrogen atoms or/and two or more substituents, preferably selected from halogens, hydroxyl, amino, sulfo, phospho, carboxyl, aldehyde, C₁-C₄-alkoxy or/and C₁-C₄-alkoxycarbonyl groups,

or one or more of the radicals R₁-R₇, in each case with adjacent substituents, form a ring system which can contain one or more multiple bonds,

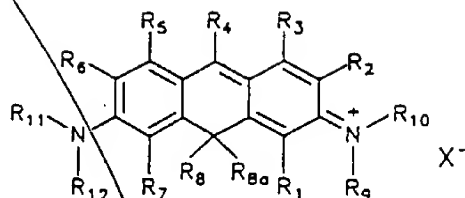
R₈ and R_{8a} in each case independently are a saturated or unsaturated, straight-chain, branched or cyclic hydrocarbon group having up to 20 carbon atoms, e.g. a C₁-C₆-alkyl group, in particular methyl, ethyl, propyl or/and butyl, or an aryl or heteroaryl group, in particular phenyl, which optionally contain heteroatoms such as oxygen, sulfur or nitrogen atoms or/and one or more substituents, preferably selected from halogens, hydroxyl, amino, sulfo, phospho, carboxyl,

aldehyde, C₁-C₄-alkoxy or/and C₁-C₄-alkoxycarbonyl groups,

or alternatively R₈ and R_{8a} can form a ring system, R₉, R₁₀, R₁₁ and R₁₂ in each case independently are hydrogen or a saturated or unsaturated, straight-chain, branched or cyclic hydrocarbon group having up to 20 C atoms, e.g. polyether, phenyl, phenyl-alkyl having 1-3 C atoms in the chain, where the hydrocarbon groups can optionally contain hetero-atoms such as oxygen, sulfur or nitrogen atoms or/and one or more substituents, preferably selected from halogens, hydroxyl, amino, sulfo, phospho, carboxyl, carbonyl, alkoxy or/and alkoxy-carbonyl groups,

or one or more of the radicals R₉-R₁₂, in each case with adjacent substituents, form a ring system which can contain one or more multiple bonds, where -N(R₉)(R₁₀) or/and =N(R₁₁)(R₁₂) can be replaced by -OR⁹ or/and =O, and X is optionally anions present for charge equalization.

2. The use as claimed in claim 1, **characterized in that** the compound I is coupled covalently to a receptor specific for the analyte to be detected.
3. The use as claimed in claim 1 or 2, **characterized in that** the detection procedure is selected from nucleic acid hybridization procedures and immunochemical procedures.
4. A compound of the general formula I



I

where R_1 - R_{12} and X have the meanings indicated in claim 1, with the proviso that if R_1 - R_3 and R_5 - R_7 are hydrogen and R_8 , R_{8a} and R_9 - R_{12} are methyl, R_4 is not hydrogen, methyl, isopropyl, phenyl, 2,6-dimethylphenyl or 2-isopropenylphenyl.

5. A compound as claimed in claim 4,

characterized in that

R_6 is bridged with R_{11} or/and R_7 with R_{12} , R_1 with R_{10} or/and R_2 with R_9 and form a ring system which preferably contains 5- or 6-membered rings which can contain one or more multiple bonds.

6. A compound as claimed in claim 4 or 5,

characterized in that

R_4 is hydrogen, C_1 - C_6 -alkyl or a radical containing an aromatic ring system.

7. A compound as claimed in one of claims 4 to 6,

characterized in that

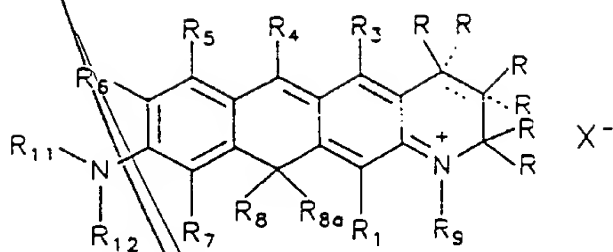
R_8 and R_{8a} are in each case independently methyl, ethyl or/and phenyl.

8. A compound as claimed in one of claims 4 to 6, which corresponds to one of the general formulae IVa to IVe.

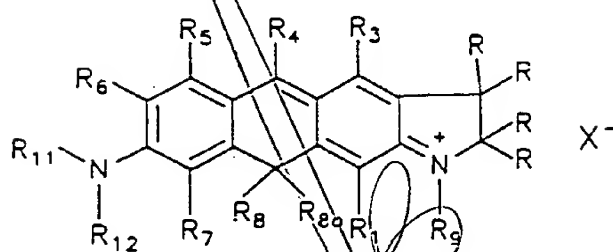
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Sub
A1

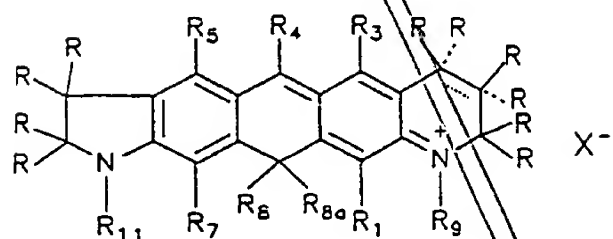
Sub
A2



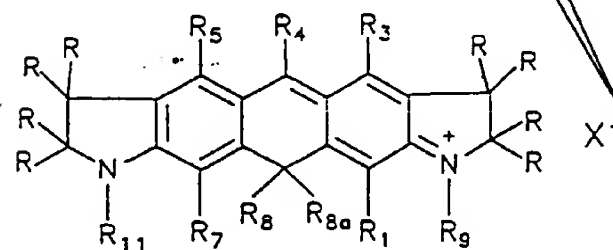
IVa



IVb



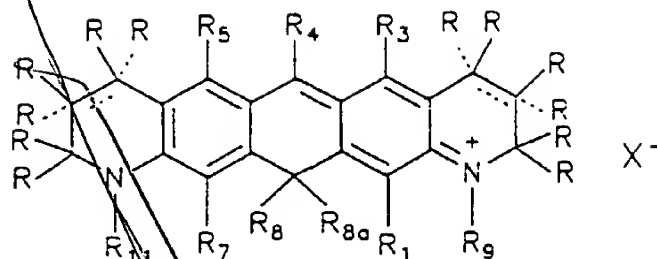
IVc



IVd

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Q2



IVe

in which
the dashed lines are optionally double bonds, and
in the presence of the double bonds the radicals R
bonded via a dashed line are absent,
R₁, R₃, R₄, R₅, R₆, R₇, R₈, R_{8a}, R₉, R₁₁, R₁₂ and X are
as defined in claim 1,
and R, on each occurrence, can be identical or
different and is defined as R₁-R₇ in claim 1.

9. A compound as claimed in one of claims 4 to 8,
characterized in that
it has a group capable of covalent coupling.
10. A compound as claimed in claim 9,
characterized in that
the coupling group is -COOH, -NH₂, -OH or/and -SH.
11. A compound as claimed in claim 9 or 10,
characterized in that
it is coupled to a carrier or/and to a biomolecule
via coupling groups.
12. A compound as claimed in claim 10,
characterized in that
the carrier is selected from porous glass, ion-
exchange resins, dextrans, cellulose, cellulose
derivatives or/and hydrophilic polymers.
13. A compound as claimed in claim 10,
characterized in that
the biomolecule is selected from peptides, poly-

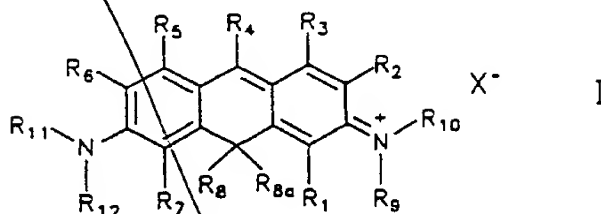
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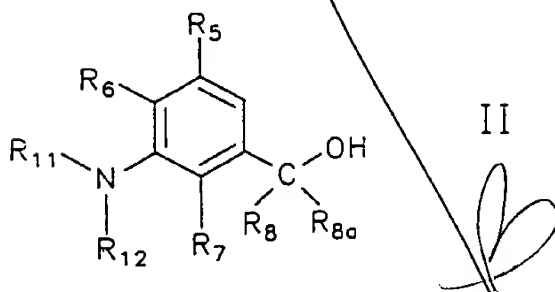
Q3

peptides, nucleotides, nucleosides, nucleic acids, nucleic acid analogs or/and haptens.

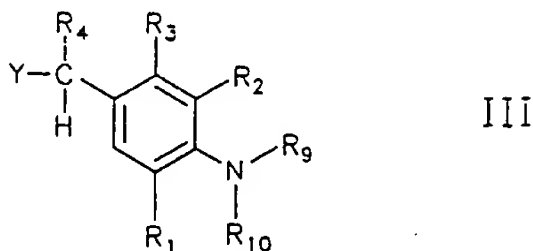
14. A process for the preparation of compounds of the general formula I



where R₁-R₁₂ and X have the meanings indicated in claim 1,
characterized in that
a compound of the general formula II



in which R₅, R₆, R₇, R₈, R_{8a}, R₁₁, R₁₂ are as defined in claim 1, or the dehydration product of II is reacted with a compound of the general formula III or its dehydration product



in which R₁-R₄, R₉ and R₁₀ are as defined in claim 1 and Y is a halogen, in particular bromine, a

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hydroxyl or thio group, in a suitable solvent, under acidic conditions and in the presence of a catalyst and the compound formed by ring closure between the compound II or its dehydration product and the compound III or its dehydration product is optionally reacted by oxidation to give the dye I.

15. The process as claimed in claim 14,
characterized in that
the solvent is a nonpolar solvent, in particular methylene chloride, 1,2-dichloroethane or chloroform.
16. The process as claimed in one of claims 14 to 15,
characterized in that
the catalyst is boron trichloride.
17. The process as claimed in one of claims 14 to 16,
characterized in that
the acid is sulfuric acid, phosphoric acid or polyphosphoric acid.
18. The process as claimed in one of claims 14 to 17,
characterized in that
the oxidant is tetrabutylammonium (meta)periodate.
19. The process as claimed in one of claims 14 to 18,
characterized in that
the compound (I) is obtained without isolation of intermediates.

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Add
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